

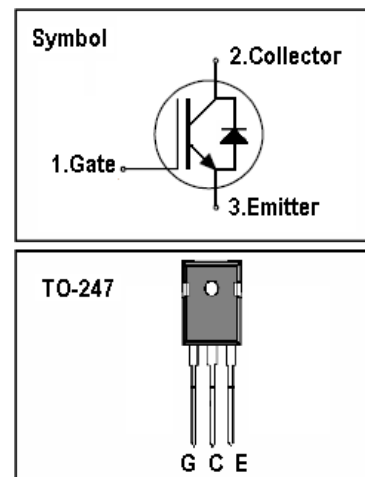
IGBT

Features

- 600V,60A
- $V_{CE(sat)(typ.)}=1.85V@V_{GE}=15V,I_C=60A$
- High speed switching
- Higher system efficiency
- Soft current turn-off waveforms

General Description

JIAEN Trench IGBTs offer lower losses and higher energy efficiency for application such as SMPS, general inverter and other soft switching applications.



Absolute Maximum Ratings

Symbol	Parameter	Value	Units
V_{CES}	Collector-Emitter Voltage	600	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Continuous Collector Current ($T_C=25^\circ C$)	120	A
	Continuous Collector Current ($T_C=100^\circ C$)	60	A
I_{CM}	Pulsed Collector Current (Note 1)	180	A
I_F	Diode Continuous Forward Current ($T_C=100^\circ C$)	60	A
I_{FM}	Diode Maximum Forward Current (Note 1)	180	A
t_{sc}	Short Circuit Withstand Time	10	us
P_D	Maximum Power Dissipation ($T_C=25^\circ C$)	315	W
	Maximum Power Dissipation ($T_C=100^\circ C$)	125	W
T_J	Operating Junction Temperature Range	-55 to +150	$^\circ C$
T_{STG}	Storage Temperature Range	-55 to +150	$^\circ C$

Thermal Characteristics

Symbol	Parameter	Max.	Units
$R_{th\ j-c}$	Thermal Resistance, Junction to case for IGBT	0.4	$^\circ C/ W$
$R_{th\ j-c}$	Thermal Resistance, Junction to case for Diode	0.5	$^\circ C/ W$
$R_{th\ j-a}$	Thermal Resistance, Junction to Ambient	40	$^\circ C/ W$

Electrical Characteristics ($T_C=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units	
BV_{CES}	Collector-Emitter Breakdown Voltage	$V_{GE}=0V, I_C=250\mu A$	600	-	-	V	
I_{CES}	Collector-Emitter Leakage Current	$V_{CE}=600V, V_{GE}=0V$	-	-	100	μA	
I_{GES}	Gate Leakage Current, Forward	$V_{GE}=20V, V_{CE}=0V$	-	-	200	nA	
	Gate Leakage Current, Reverse	$V_{GE}=-20V, V_{CE}=0V$	-	-	200	nA	
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE}=V_{CE}, I_C=250\mu A$	4.5	-	6.5	V	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$V_{GE}=15V, I_C=60A$	-	1.85	2.4	V	
Q_g	Total Gate Charge	$V_{CC}=400V$ $V_{GE}=15V$ $I_C=60A$	-	190	-	nC	
Q_{ge}	Gate-Emitter Charge		-	75	-	nC	
Q_{gc}	Gate-Collector Charge		-	55	-	nC	
C_{ies}	Input Capacitance	$V_{CE}=25V$ $V_{GE}=0V$ $f=1\text{MHz}$	-	2960	-	pF	
C_{oes}	Output Capacitance		-	220	-	pF	
C_{res}	Reverse Transfer Capacitance		-	34	-	pF	
$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=400V$ $V_{GE}=15V$ $I_C=60A$ $R_G=10\Omega$ Inductive Load 100 μH $T_C=25^\circ\text{C}$	-	94	-	ns	
t_r	Turn-on Rise Time		-	92	-	ns	
$t_{d(off)}$	Turn-off Delay Time		-	335	-	ns	
t_f	Turn-off Fall Time		-	60	-	ns	
E_{on}	Turn-on Switching Loss		-	3.5	-	mJ	
E_{off}	Turn-off Switching Loss		-	1.4	-	mJ	
E_{ts}	Total Switching Loss		-	4.9	-	mJ	
$t_{d(on)}$	Turn-on Delay Time		$V_{CC}=400V$ $V_{GE}=15V$ $I_C=60A$ $R_G=10\Omega$ Inductive Load 100 μH $T_C=125^\circ\text{C}$	-	89	-	ns
t_r	Turn-on Rise Time			-	91	-	ns
$t_{d(off)}$	Turn-off Delay Time	-		360	-	ns	
t_f	Turn-off Fall Time	-		56	-	ns	
E_{on}	Turn-on Switching Loss	-		3.6	-	mJ	
E_{off}	Turn-off Switching Loss	-		1.5	-	mJ	
E_{ts}	Total Switching Loss	-		5.1	-	mJ	

Electrical Characteristics of Diode ($T_C=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	$I_F=60A$	-	1.5	2.0	V
t_{rr}	Diode Reverse Recovery Time	$V_{CE}=400V$ $I_F=60A$	-	135	-	ns
I_{rr}	Diode peak Reverse Recovery Current		-	5	-	A
Q_{rr}	Diode Reverse Recovery Charge	$dI_F/dt=200A/\mu s$	-	310	-	nC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature

Typical Performance Characteristics

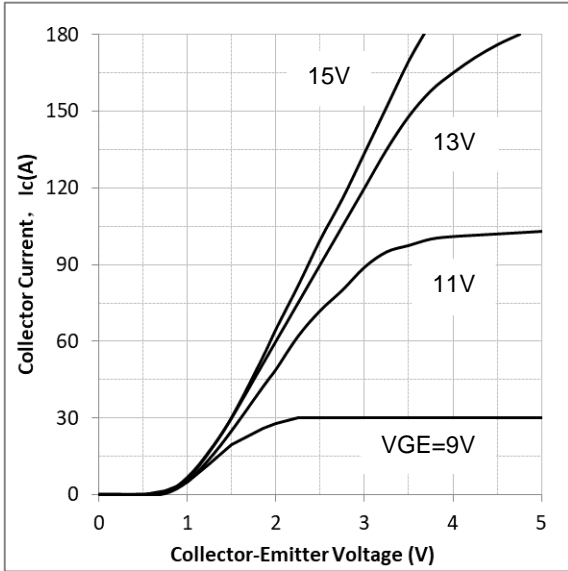


Figure 1. Typical Output Characteristics,
 $T_c=25^\circ\text{C}$

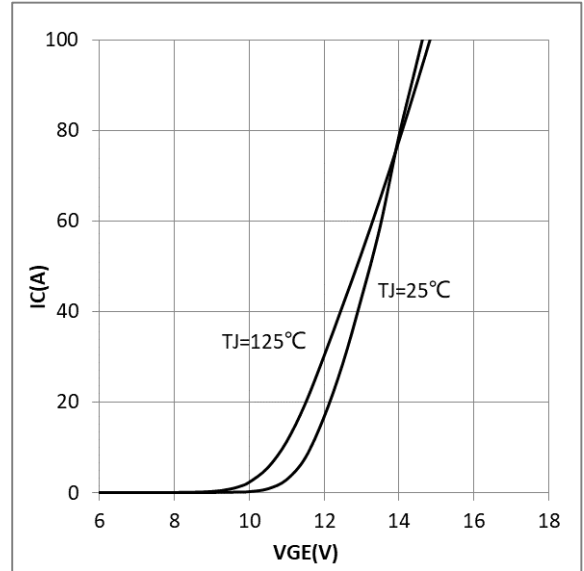


Figure 2. Transfer Characteristics

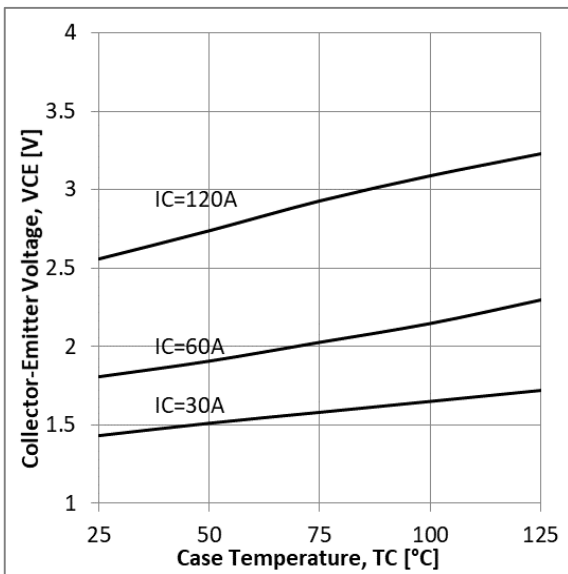


Figure 3. Saturation Voltage
vs. Case Temperature,
Common Emitter, $V_{GE}=15\text{V}$

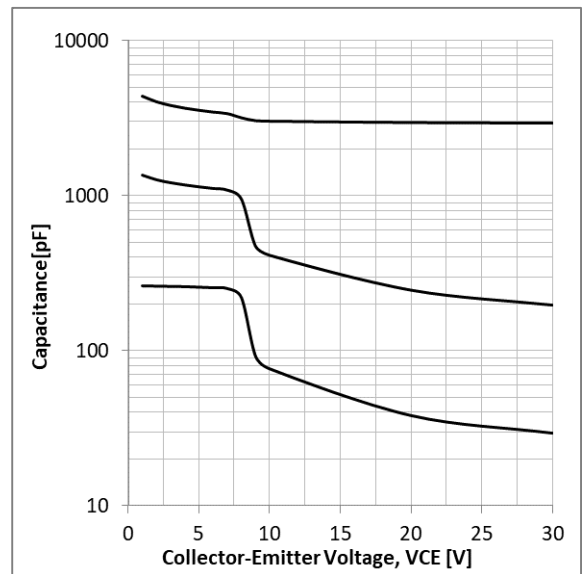


Figure 4. Capacitance Characteristics,
Common Emitter, $V_{GE}=0\text{V}$, $f=1\text{MHz}$, $T_c=25^\circ\text{C}$

Typical Performance Characteristics

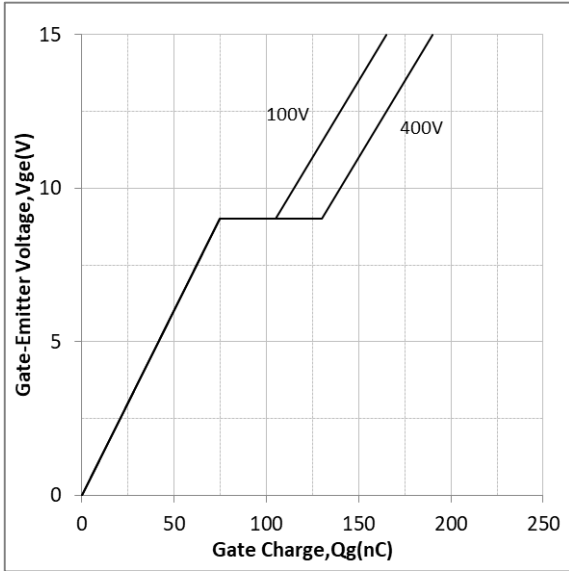


Figure 5. Gate charge Characteristics,
Common Emitter $T_c=25^\circ\text{C}$

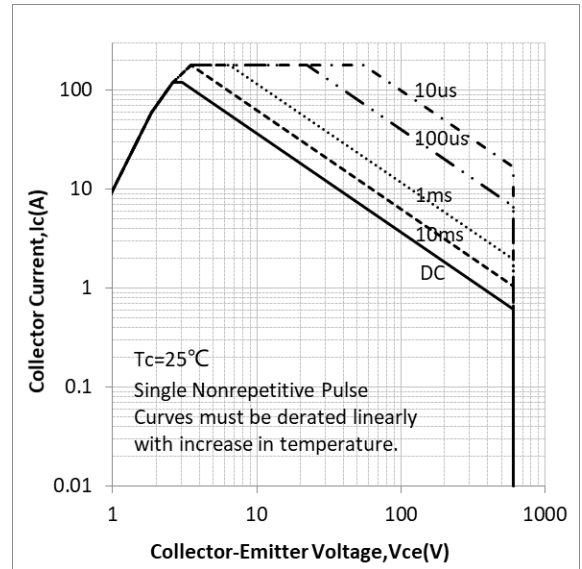


Figure 6. SOA Characteristics

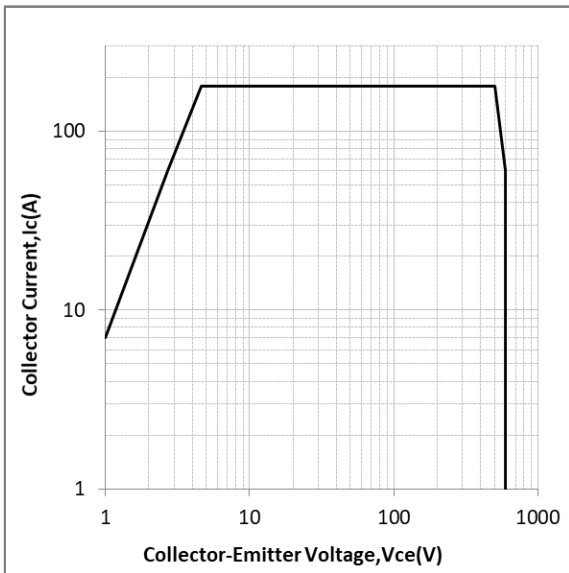


Figure 7. Turn Off Switch SOA
Characteristics , $V_{GE}=15\text{V}$ $T_c=125^\circ\text{C}$

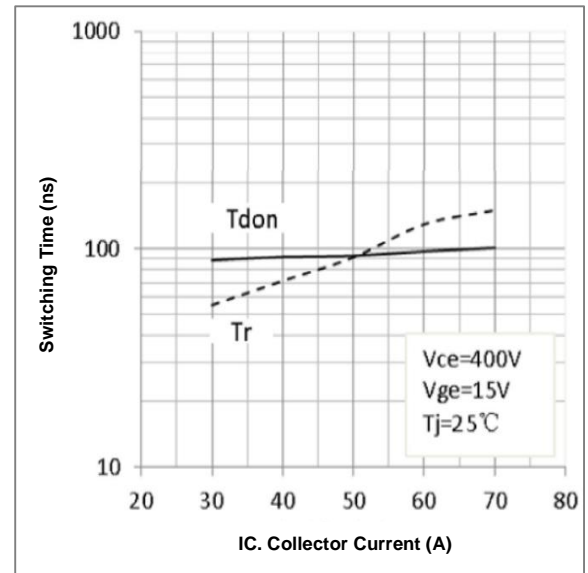


Figure 8. Turn-on Characteristics vs.
Collector Current, $R_G=10\Omega$

Typical Performance Characteristics

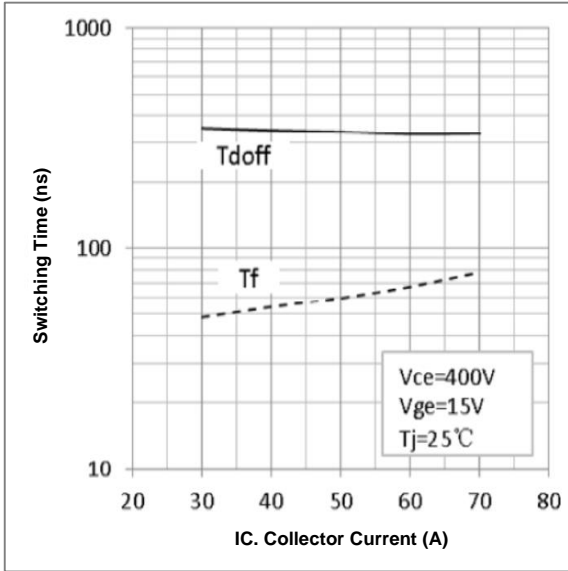


Figure 9. Turn-off Characteristics vs. Collector Current, $R_G=10\Omega$

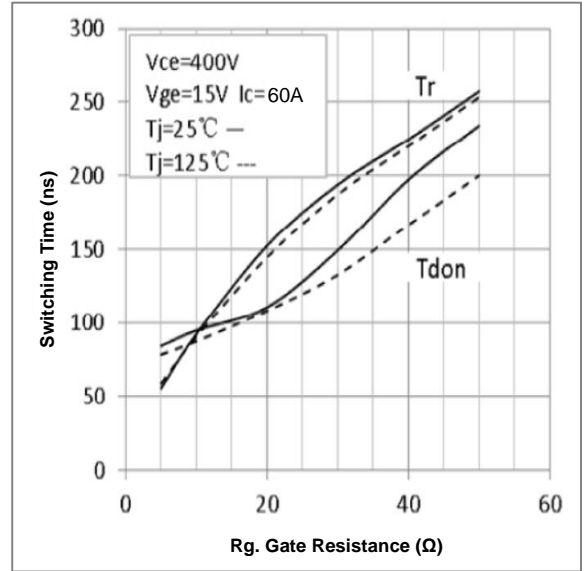


Figure 10. Turn-on Characteristics vs. Gate Resistance

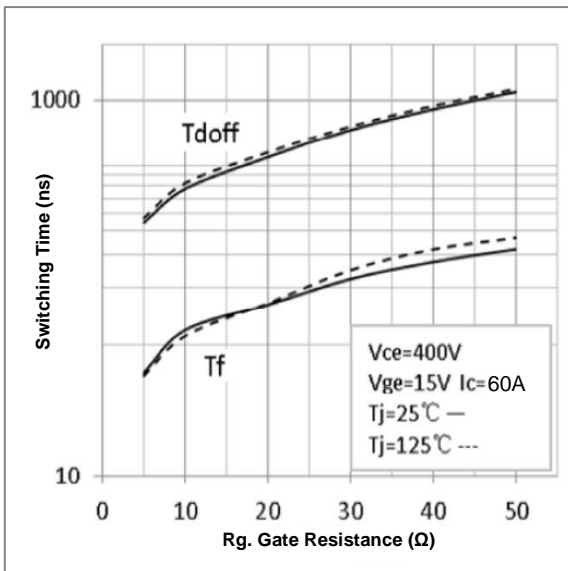


Figure 11. Turn-off Characteristics vs. Gate Resistance

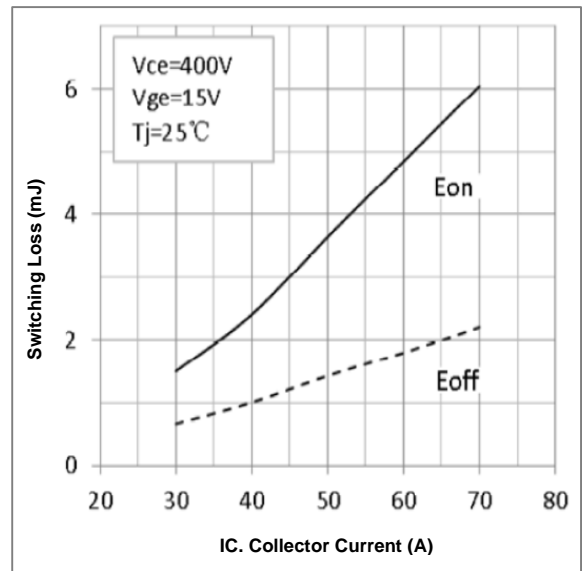


Figure 12. Switch Loss vs Collector Current , Comment Emitter , $R_G=10\Omega$

Typical Performance Characteristics

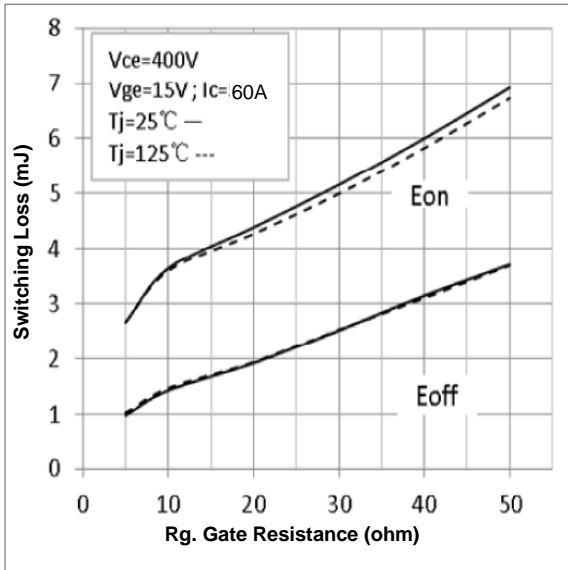


Figure 13. Switch Loss vs Gate Resistance ,

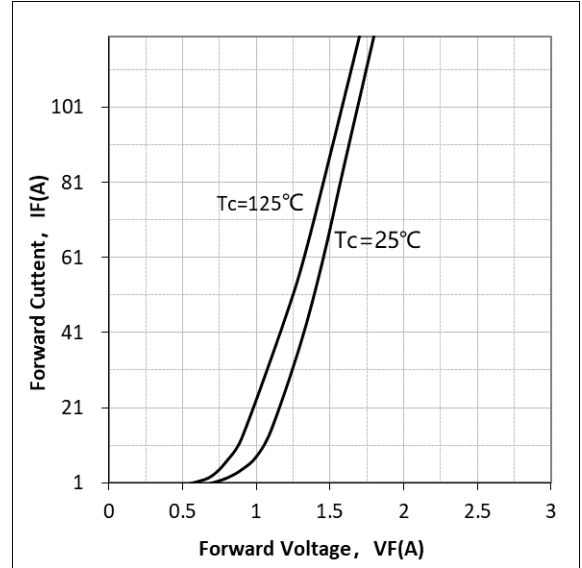


Figure 14. Forward Characteristics

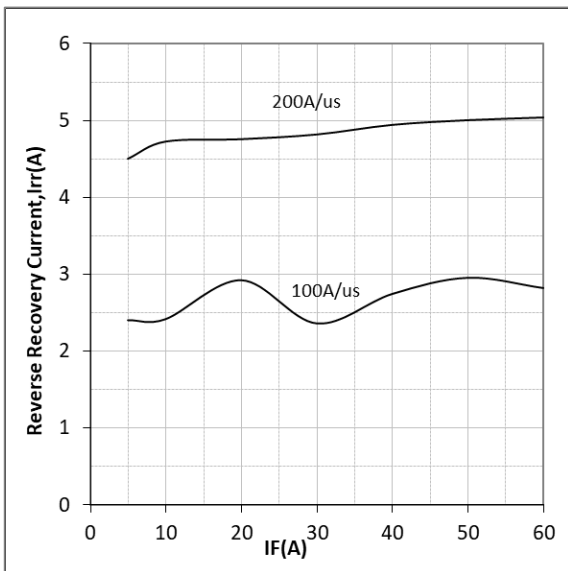


Figure 15. Reverse Recovery Current,
Tc=25°C

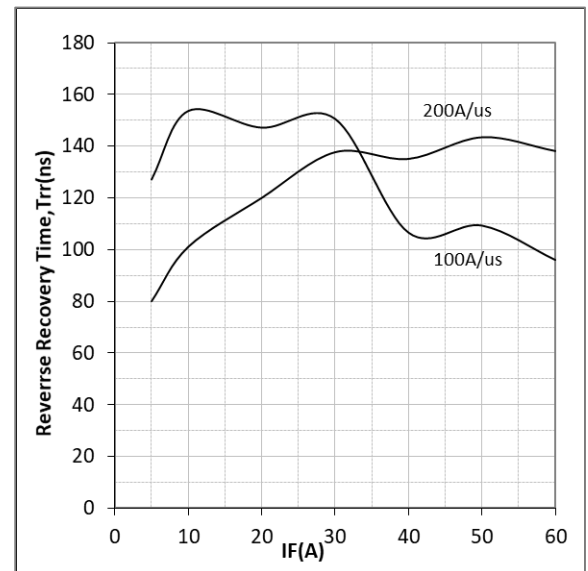


Figure 16. Reverse Recovery Time,
Tc=25°C

Typical Performance Characteristics

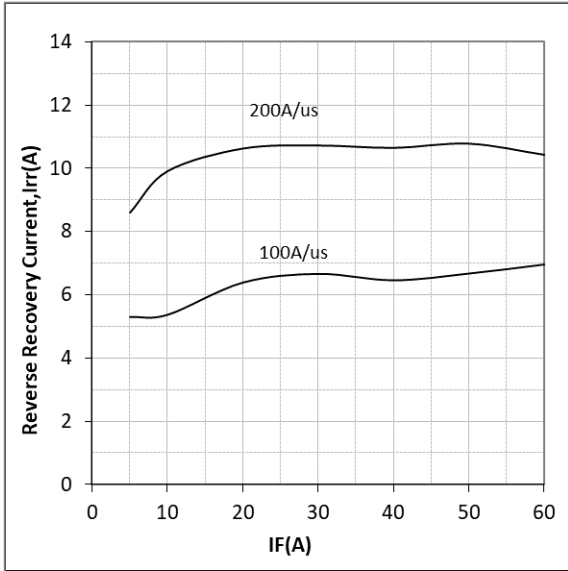


Figure 17. Reverse Recovery Current,
 $T_c=125^\circ C$

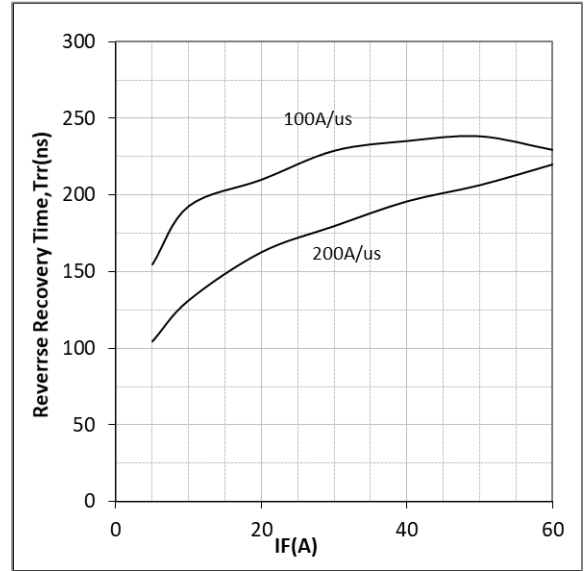


Figure 18. Reverse Recovery Time,
 $T_c=125^\circ C$

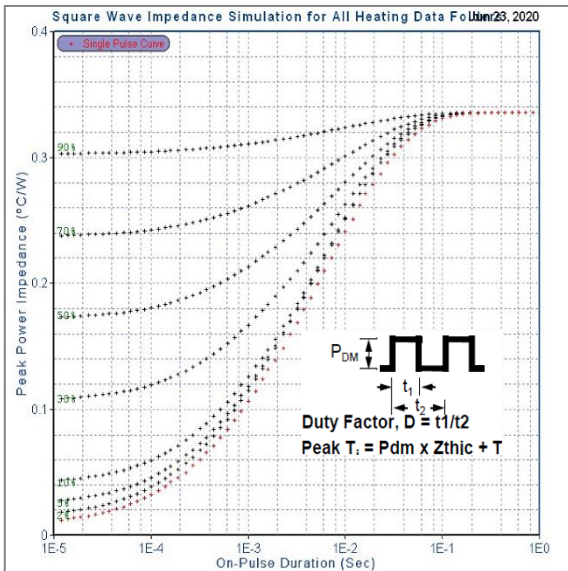


Figure 19. Transient Thermal Impedance of
IGBT

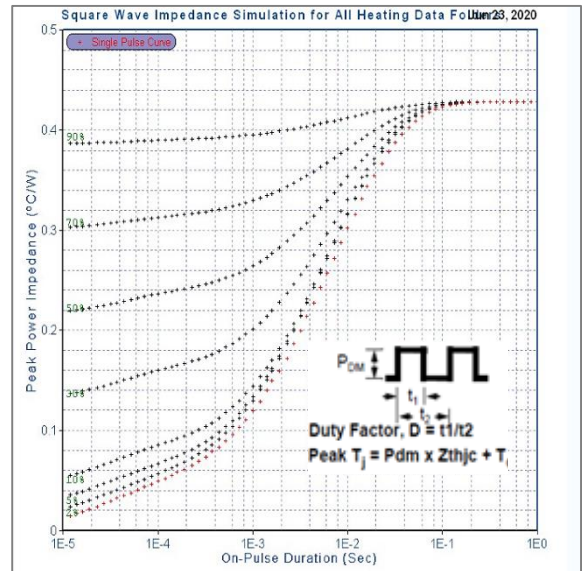
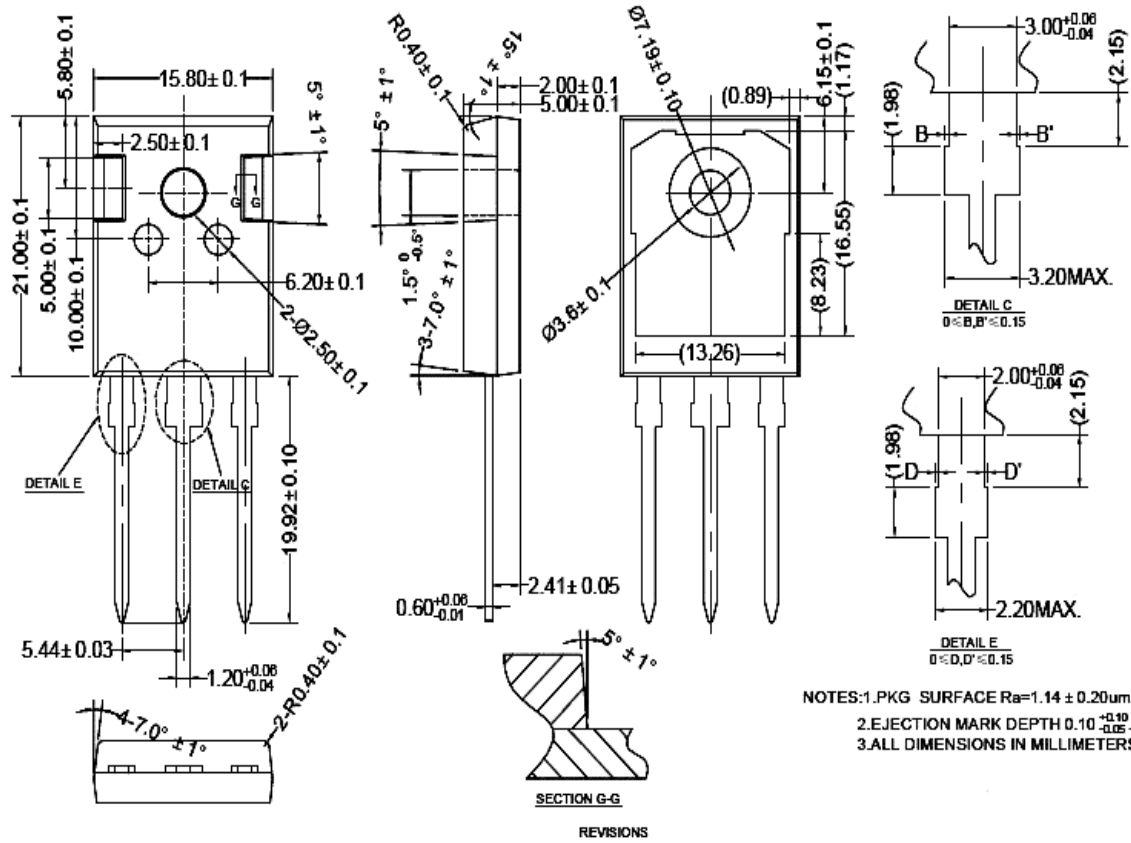


Figure 20. Transient Thermal Impedance of
FRD

TO247 PACKAGE OUTLINE



NOTES: 1. PKG SURFACE Ra=1.14 ± 0.20µm.
2. EJECTION MARK DEPTH 0.10 ^{+0.10}/_{-0.05}
3. ALL DIMENSIONS IN MILLIMETERS.

公差标注	公差值	表面粗糙度
0	±0.2	Ra3.2~6.3
0.0	±0.1	Ra1.6~3.2
0.00	±0.01	Ra0.8~1.6
0.000	±0.005	Ra0.4~0.8
0.0000	±0.002	Ra0.2~0.4

0 ≤ D, D' ≤ 0.15

NOTES: 1. PKG SURFACE Ra=1.14 ± 0.20µm.
2. EJECTION MARK DEPTH 0.10 ^{+0.10}/_{-0.05}
3. ALL DIMENSIONS IN MILLIMETERS.

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